



# INTERNATIONAL TSUNAMI INFORMATION CENTER NEWSLETTER

ITIC • P.O. BOX 3887 • HONOLULU, HAWAII 96812 • USA

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## DATA TELEMETRY SYSTEM FOR TSUNAMI WARNING

Mr. G. C. Dohler of the Tides Division in the Department of Energy, Mines and Resources, Canada, has informed ITIC of refinements of an installation put into operation about a year ago to transmit tidal heights to Honolulu. The announcing system has been developed by HAGENUK Company of Kiel, Germany, at the suggestion of the Canadian Hydrographic Service and has been installed at Victoria. The Tele-Announcing System has the following components:

1. A data transmitter which is mounted over a stilling well and by means of a chain pulley and float arrangement converts analogue data into electrical digits.
2. A memory unit which stores the last minimum or maximum water level information and, in case of a tsunami, is capable of storing ten successive water level data points.
3. An announcing unit which, when addressed, announces the existing waterlevel, the rising or falling tendency, the last high or low water, or the stored tsunami data. (The unit operates on a combination of electrical and mechanical principles.)
4. A dialing unit which, upon arrival of a tsunami, calls automatically a predetermined party.
5. A power supply which converts the 117 volt 60 cycle per second line voltage into voltages necessary to the functional parts of the unit.

The tele-announcer is set up in a place of an ordinary telephone set and is addressed by dialing the number of the telephone line. The ringing current activates the relay that closes the line for DC and initiates the internal sequence of operations. Upon completion of this sequence, the unit disconnects itself and is then ready for another telephone call. The arrival of a tsunami is detected as follows: At each regular change of tendency in water fluctuation (as in a change of tide), a time delay relay is energized. It must be adjusted to the shortest interval observed between the high and low water at each particular gauge station. For example, at Tofino this difference is about four and one-half hours. The dialing unit is triggered if a tendency change occurs at less than four and one-half hours and the unit calls the assigned party, e.g., the Tsunami Warning Center at Honolulu. Then the dialing unit switches on the announcing unit to repeat a warning message for a predetermined time interval. At the same time, another delay relay is energized to store the corresponding water levels occurring within an interval of one half to six minutes. Ten data points can be stored and the course of the tsunami is registered for that period. If addressed, after the ten data points have been stored, the announcing unit will produce water levels in centimeters and will indicate the tendency of change. The stored tsunami data will be cancelled by the next tidal change and then the tele-announcer will deliver again its regular water level data or warning. According to Mr. Dohler, it is hoped that in the near future, a punch paper tape gauge can be attached to the described instrumentation which will start whenever a tsunami is being generated to collect at one-minute intervals over a period of one day, the tsunami fluctuations. In other words, one would have immediately, after a tsunami passes the installation, tidal data available over a period of 10 to 30 minutes and with the additional punch tape eventually the complete tsunami, one day later. The punched tape could be laid out in such a way that the information could be transmitted via Telex directly to ITIC. Mr. Dohler informs us that his Department has in operation a gauge with telemetry capabilities at Victoria and that the tide gauge station at Tofino will be equipped by late September with the tele-announcer and the punch paper tape system described above. Also the Canadian Department of Energy, Mines and Resources is investigating the possibility of installing a tsunami sensor along the northwest coast of the Queen Charlotte Islands during 1968-69.

#### UNUSUAL WAVES IN CHILE, JULY 25-26: GEORGE PARARAS-CARAYANNIS, ITIC

Abnormally high water was observed along the Chilean coast beginning early in the morning of July 23. Maximum effects were felt in Valparaiso on July 25 coinciding with high tide at 1024 local time. The northern coast of Chile from Antofagasta to Arica did not experience high waves until the morning of July 26. Waves 15 to 18 feet were reported from Valparaiso and Antofagasta, and the Center for Short-lived Phenomena of the Smithsonian Institution issued information reports. According to news paper accounts, a great part of the coastal section of Valparaiso and other coastal cities were inundated by high water which in many respects resembled a tsunami. The phenomenon lasted for three consecutive days and during that time dozens of large

and small boats were destroyed, numerous houses were flooded or demolished, traffic was disrupted and damages exceeded 1 billion pesos. The origin of the waves was originally a puzzle and earthquakes and nuclear explosions were considered as the possible causes. Both, however, have been definitely ruled out. The French detonated nuclear devices on July 7 and 15 in the vicinity of Fangataufa Atoll about 800 miles southeast of Tahiti, but the waves observed in Chile could not be linked with these tests. An earthquake of magnitude 6.9 on the Richter scale occurred at 0723Z July 25, in the vicinity of Kermadec Islands, but the travel times did not match for Chile, and no waves were observed near the epicenter. No other earthquake was recorded that could have caused a tsunami in Chile. The phenomenon is ascribed to the unfortunate combination of high tides, a low atmospheric pressure area, and severe storm waves. The high tides are not unusual this time of the year for Chile and are locally called "sicigias". The low atmospheric pressure also resulted in a higher level of the sea and superimposed on the new sea level were the waves from a distant storm. Inspection of weather satellite pictures failed to show any storms from 110° W to the coast of Chile. Synoptic weather charts however, showed the existence of two large storms that can account for the large waves which were observed in Valparaiso, Arica, Antofagasta and elsewhere in Chile. Both storms originated in the same approximate location at 40° S Latitude and 100° W Longitude. The first storm began on July 20 and moved in a clockwise direction closer to South America and died down on July 24 at Latitude 55° S, Longitude 80° W on July 26. There, it lost its strength. The intensity of both storms and the wind velocities associated with them are not known, but their fetches were estimated to be in excess of 1500 nautical miles.

#### STANDARDIZATION OF WAVE HEIGHT REPORTING

Following a recommendation at the March 1968 meeting of the International Coordinating Group, ITIC has initiated a survey that will assist in the standardization of the wave height reporting procedures for the tide stations contributing to the Tsunami Warning System. Forms have been mailed to all tide gauge stations, requesting information on whether the height reported is height above sea level, double amplitude (range) or height above a certain datum. In addition, other information is requested concerning the units that are used, in reporting the recording range of each gauge, its construction and its location. Once this data is compiled, it will be evaluated and recommendations will be made to the International Coordinating Group for the Tsunami Warning System.

#### WORLD ATLAS OF TSUNAMI MARIGRAMS

ITIC is assisting Dr. Soloviev (USSR) and the IUGG tsunami committee, on the preparation of a World Atlas of Tsunami Marigrams. This Atlas will be the first of its kind and will be a basic tool of great help to the scientific community concerned with tsunami problems. To this day, listings of marigrams have been solicited from Japan, Chile,

France, U.S., USSR, Canada, Indonesia, Philippines, Okinawa, Republic of Korea, Mexico, Australia, New Caledonia and New Zealand. An inventory of all tsunami marigrams is presently being taken and records missing from the ITIC library will be solicited. The World Atlas of Tsunami Marigrams will be published as an IUGG monogram or possibly as a data report in the ITIC report series.

# TSUNAMI INVESTIGATIONS, JUNE-JULY-AUGUST 1968

June, July and August 1968 were busy months for the International Tsunami Information Center's Honolulu Observatory. During this period, the whole Pacific Basin appeared to have more than its regular share of large earthquakes and personnel at the Observatory were kept busy treating all of them as potentially tsunamigenic events until proven otherwise. Fortunately none of these earthquakes resulted in a Pacific-wide tsunami. The following events were investigated:

| <u>Dates &amp; Time</u><br><u>GMT</u> | <u>Epicenter</u>  | <u>Magn.</u><br><u>&amp; Depth</u> | <u>Region</u>                    | <u>Comments</u>  |
|---------------------------------------|-------------------|------------------------------------|----------------------------------|--|
| June 12, 1968<br>1342                 | 39° N<br>143 E    | 7.3                                | Japan<br>N.E. Honshu             | Local tsunami; at Hachinohe - wave 39 cm in range began at 1437Z; In S.E. Honshu - wave 65 cm in range recorded at 142 |
| June 19, 1968<br>0813                 | 5.5 S<br>76.5 W   | 7.0                                | Northern Peru                    | No evidence of tsunami   |
| July 5, 1968<br>1128                  | 38.4 N<br>142.2 E | 6.0<br>40 Km                       | Japan<br>North Honshu            | No evidence of tsunami   |
| July 25, 1968<br>0723                 | 30 S<br>178.5 W   | 6.8                                | Kermadec Is.                     | Suva, Fiji Is. observed small change in sea level 10 cm in range   |
| July 29, 1968<br>2352                 | 1.5 S<br>132.5E   | 6½                                 | Near New Guinea                  | No evidence of tsunami   |
| Aug. 1, 1968<br>2019                  | 16 N<br>122 E     | 7.0                                | Philippine Isl<br>Northern Luzon | No evidence of tsunami   |
| Aug. 2, 1968<br>1407                  | 16.5 N<br>97 W    | 7.3                                | Mexico                           | Near Puerto Angel<br>No evidence of tsunami  |
| Aug. 3, 1968<br>0454                  | 24.5 N<br>126 E   | 6.3                                | Ryuku Is.                        | No evidence of tsunami   |
| Aug. 10, 1968                         | 01 N<br>124 E     | 7.3                                | Celebes Sea                      | Local tsunami; Huge waves swept coastal areas in the Donggala district of Celebes Is. Numerous deaths and damages      |

| Dates & Time<br>GMT   | Epicenter        | Magn.<br>& Depth | Region      | Comments  |
|-----------------------|------------------|------------------|-------------|---|
| Aug. 14, 1968<br>2214 | 01° N<br>119.7 E | 7.4              | Celebes Sea | Island of Tuguan at north tip of Celebes Is. submerged and disappeared. Large local tsunami |
| Aug. 18, 1968<br>1838 |                  | 6.5              | Solomon Is. | No evidence of tsunami  |

#### EARTHQUAKES AND TSUNAMIS IN INDONESIA - AUGUST 10 AND 14, 1968

A strong earthquake shook Central Sulawesi Island (Celebes Is.), Indonesia at 0207Z on August 10, 1968. The epicenter of the earthquake as determined by Honolulu Observatory was at 1° N Latitude, 124° E Longitude in the Celebes Sea and not in the Molucca Sea as originally believed. Its magnitude was determined to be 7.3 on the Richter scale.

The Indonesian Bureau of Natural Disasters announced that huge tsunami waves were generated that swept the coastal areas in the Donggala district of the Island. Two hundred people were killed and numerous houses were destroyed especially in the coastal village of Tambu. No attempt was made to separate the earthquake fatalities and damages from those made by the tsunami waves. The island of Tuguan off the North Celebes Is. coast with several hundreds of inhabitants was engulfed by large tsunami waves and partly subsided.

A second earthquake at 2214Z August 14, 1968 similarly shook the island. The epicenter of this earthquake was determined to be at 1.0° Latitude, 119.7° E. Longitude in the vicinity of Makassar Strait. Its magnitude was 7.4 on the Richter scale. According to Indonesia's Antara News agency, this second earthquake also generated waves. The island of Tuguan submerged completely and disappeared. A police launch dispatched from Mangalihat Point lighthouse on the island of Borneo found no trace of Tuguan or its inhabitants. Volcanoes in the Sangihe-Talaud Island Group off the northern tip of the Celebes Is. had begun rumbling and smoking following the earthquakes. Minor earthquake activity is still being recorded in the area three weeks later, and activity of the volcanoes in the Talaud and Sangihe island groups are threatening the 200,000 people who live in the islands. Authorities have asked ships in the area to assist in the evacuation of residents.

#### USSR PROPOSES NEW REPRESENTATIVE TO THE ICG

Mr. Tolstikov, Acting Chief of the Hydrometeorological Service of USSR has proposed to UNESCO that Dr. Abuziarov Ziydin Kaumovivitch be appointed as the USSR representative to the International Coordinating Group for the Tsunami Warning System. Dr. Kaumovivitch is a specialist in the field of tsunamis.